SECTION 403
SYSTEM ANALYSIS FOR
RENEWABLE ENERGY SOURCES ANALYSIS

403.1 General. A proposed building utilizing solar, geothermal, wind or other renewable energy sources for all or part of its energy source shall meet the requirements of Section 402, except that the provisions of this section shall also apply.

403.1.1 Equivalent energy sources. The Standard design shall use energy sources as determined by Table 403.1.1.

TABLE 403.1.1
EQUIVALENT ENERGY SOURCES

Proposed design energy source		Standard design energy source	
Space heating	**Domestic water heating**	**Space heating**	**Domestic water heating**
Some renewable energy	Some renewable energy	Non-renewable energy source used in proposed space heating design	Non-renewable energy source used in proposed domestic water heating design
Some renewable energy	All renewable energy	Non-renewable energy source used in proposed space heating design.	
All renewable energy	Some renewable energy	Non-renewable energy source used in proposed domestic water heating design	
All renewable energy	All renewable energy	Heat pump meeting requirements of Table 503.2 (p. 87)	Electric water heater meeting requirements of Table 504.2 (pg. 91)

403.1.2 Solar energy systems, active. To qualify under this section, solar energy must be derived from a specific collection, and distribution system.

403.1.3. Solar energy systems, passive. To qualify under this section, space heating energy must be derived from the absorption of solar radiation by specific building materials and its release to the conditioned space.

403.2 Documentation. Proposed alternative designs submitted as requests for exception to the Standard design criteria shall be accompanied by an energy analysis, as specified in Section 402. The report shall provide technical detail on the alternative building and system designs and on the data employed in and resulting from the comparative analysis to verify that both the analysis and the designs meet the criteria of Sections 402 and 403. The energy derived from renewable energy sources shall be clearly identified in the report.

COMPARISON OF STANDARD AND PROPOSED BUILDINGS

PROPERTIES	STANDARD DESIGN	PROPOSED DESIGN
Standard Design Requirements		
Annual energy usage	Chapter 5 compliance	No greater than standard
Exterior wall U-factors	.085 (R 11.6)	
Fenestration U-factor	.047	
Window area	18% of cond. floor area	
Skylights and ceilings	Not Used	
Proposed Design Requirements		
Energy source		Same as standard design
Conditioned floor space		Same as standard design
Geometry -Thermal envelope to floor area ratio		Same as standard design
Exterior design conditions		Same as standard design
Occupancy		Same as standard design
Climate data		Same as standard design
Usage operational schedule		Same as standard design
Glazing Systems		
Orientation	Equal areas on north, east, south, and west	Worst possible orientation for groups of buildings
Exterior shading	No exterior shading	As proposed
SHGC	0.40 during periods of HVAC operation, may be multiplied with interior shading values	As proposed
Interior shading (fraction of solar gain admitted by fenestration that is also admitted by the interior shading system)	0.70 summer 0.90 winter	As proposed
Heat storage (thermal mass)	Internal mass = 8lb. per sq. ft. Structural mass = 3.5 ob. Per sq. ft.	Internal mass = 8lb. per sq. ft. Structural mass = 3.5 ob. Per sq. ft.
Thermal envelope		
Floors, walls, ceiling	Equal area	Equal area
Foundation and floor type	Equal type	Equal type
Doors	U-factor = 0.2 Btu/hr sq. ft.	U-factor = 0.2 Btu/hr sq. ft.
Building Volume	Equal	Equal
Heating & Cooling Controls		
Heating	68ºF	68ºF
Cooling	78ºF	78ºF
Set back / set up	5ºF	Maximum of 5ºF
Set back / set up duration	6 hours per day	Maximum of 6 hours per day
Number of set back / set up periods per living unit	1	Maximum of 1
Maximum number of zones per unit	2	2
Number of thermostats per zone	1	1
Internal Heat Gains (constants)	Type A-1 = 3,000 Btu/hr per unit Type A-2 = 1,500 Btu/hr per unit	Type A-1 = 3,000 Btu/hr per unit Type A-2 = 1,500 Btu/hr per unit
Domestic Hot Water (calculate, then constant)		
Temperature set point	120ºF	120ºF
Daily hot water consumption	Gallons = (30 x a) + (10 x b)	Gallons = (30 x a) + (10 x b)
Site Weather Data	Houston zone 3b, 1371 HDD	Houston zone 3b, 1371 HDD
Forced-air Distribution System Loss Factors (DLF)	Heating & Cooling Duct Ratio: Outside = 0.80 Inside = 1.0	Can differ if leak-free and tested, using engineering methods for: Total Seasonal energy equation DLF, and Adjusted System Efficiency equation
Air Infiltration	ACH = 0.57 x Weather Factor	Credit if blower door test, but not < 0.35
Heating & Cooling Equipment Efficiency	Meet but not exceed 503.2	As proposed. If electric resistance space heating, standard must have heat pump

INTERNATIONAL ENERGY CONSERVATION CODE
Chapter 4- Residential Building Design By Systems Analysis And Design Of Buildings Utilizing Renewable Energy Sources

HIGHLIGHTS

Scope

This chapter applies to Residential structures and establishes design criteria for buildings based on Total Energy Use for all of its systems. Includes provisions for Renewable Energy Sources.

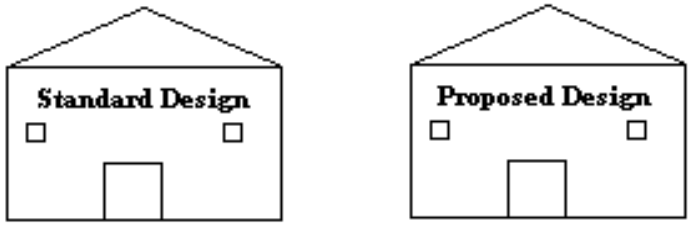
Key terms

1. **Energy Analysis**- A method for determining the annual (8,760 hours) energy use of the Proposed design and Standard design based on hour-by-hour estimates of energy use.
2. **Energy Cost**- The total estimated annual cost for purchased energy for the building, including any demand charges fuel adjustment factors and delivery charges applicable to the building.
3. **Proposed Design**- A description of the proposed building design used to estimate annual energy costs for determining compliance based on total building performance.
4. **Standard Design**- A version of the proposed design that meets the minimum requirements of this code and is used to determine the maximum annual energy cost requirement for compliance based on total building performance. The standard building is designed in accordance with a method in Chapter 5 of the code.

Standard vs. Proposed Design

This chapter requires an analysis of two buildings, a Standard vs. Proposed design building. These buildings are designed as similar buildings, with some variables that remain constant, but are not exactly the same.

Example:



Energy Code Compliance Software

Residential –	(Prescriptive)	ResCheck or RemRate
	(Systems)	Blast, RemRate or RemDesign
Commercial –	(Prescriptive)	ComCheckEZ or ComCheckPlus
	(Systems)	DOE2, Blast, Energy Plus, HAP or Trace

Design

Units of energy are expressed as Btu input per square foot of gross floor area per year (1kWh = 3,413 Btu)

If > 5,000 square feet, load calculations must be detailed for environmental requirements, climate data, building data, operational characteristics, mechanical equipment, and building loads.

An Energy Analysis report must be provided to show comparison of standard and proposed buildings.